

**Does the H-mode Power Threshold Depend on  
Proximity to Double-Null?  
(Completion of First MAST/NSTX Joint Experiment)**

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## Background

- L-H power threshold  $\sim 100\%$  higher in double-null (DN) than lower-single null (LSN) at conventional aspect ratio
- Recently MAST showed that balanced DN have lowest  $P_{LH}$
- $P_{LH} \sim 20\%$  lower in ASDEX-Upgrade for balanced DN, and DIII-D re-inspection may yield similar results
- NSTX has lowest  $P_{LH}$  in LSN, but DN not done carefully
- MAST confirmed their results in NSTX shape and startup technique in first 1/2 of joint MAST/NSTX expt.
- Proposal (1 day):
  - Measure  $P_{LH}$  as function of distance of upper and lower separatrices, mapped to outer midplane (“drsep”)
  - Compare  $P_{LH}$  in DN, USN, and LSN (larger drsep)
  - Conduct when  $P_{LH}$  low for measureable differences

## MAST Experiment Goals and Results

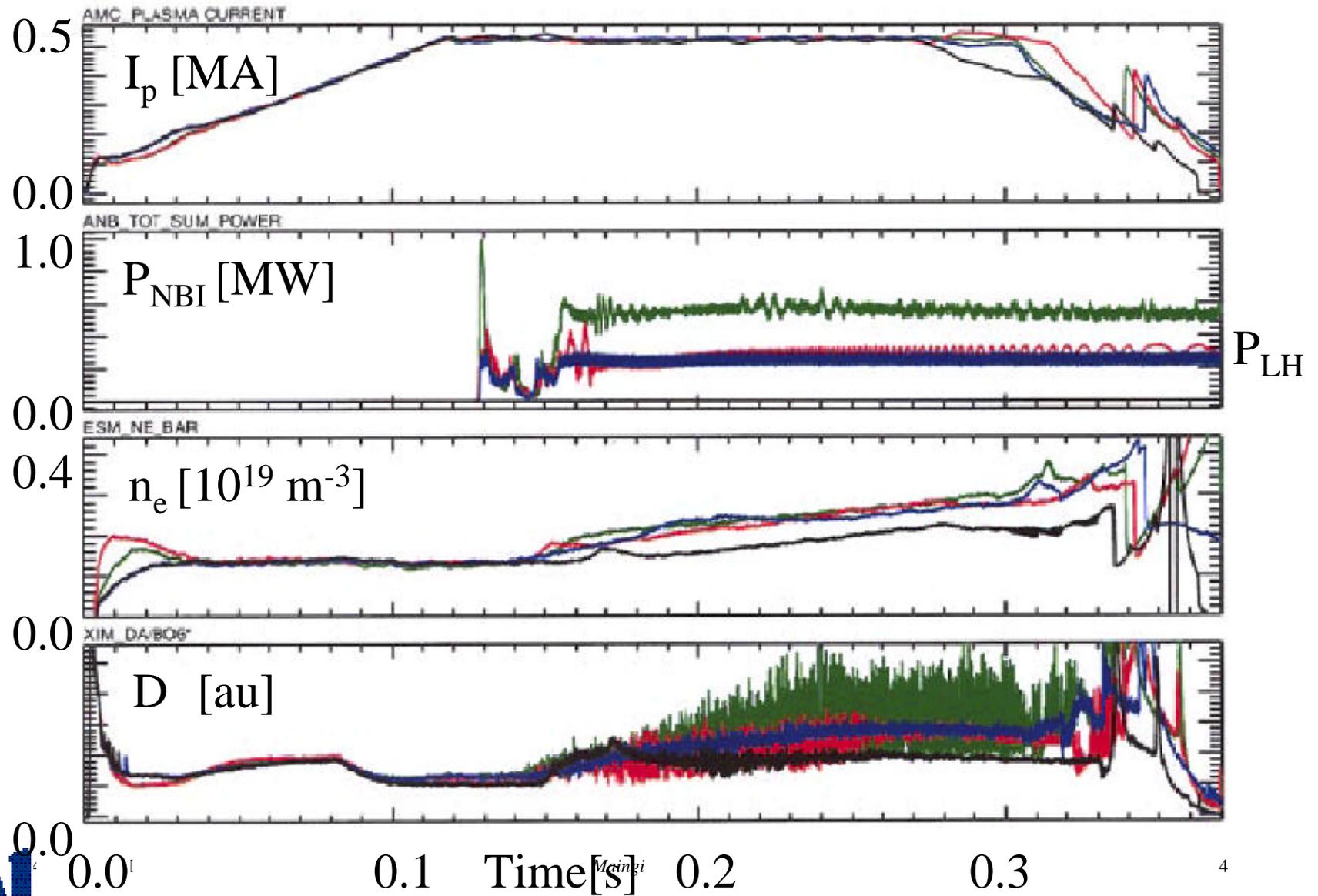
### Goals

- Measure  $P_{LH}$  in DN (NSTX shape, no ohmic H-mode)
- Measure  $P_{LH}$  in LSN
- Use 1-2 src. DN for ELMy H-mode comparison ( $I_p \sim 0.8\text{MA}$ )

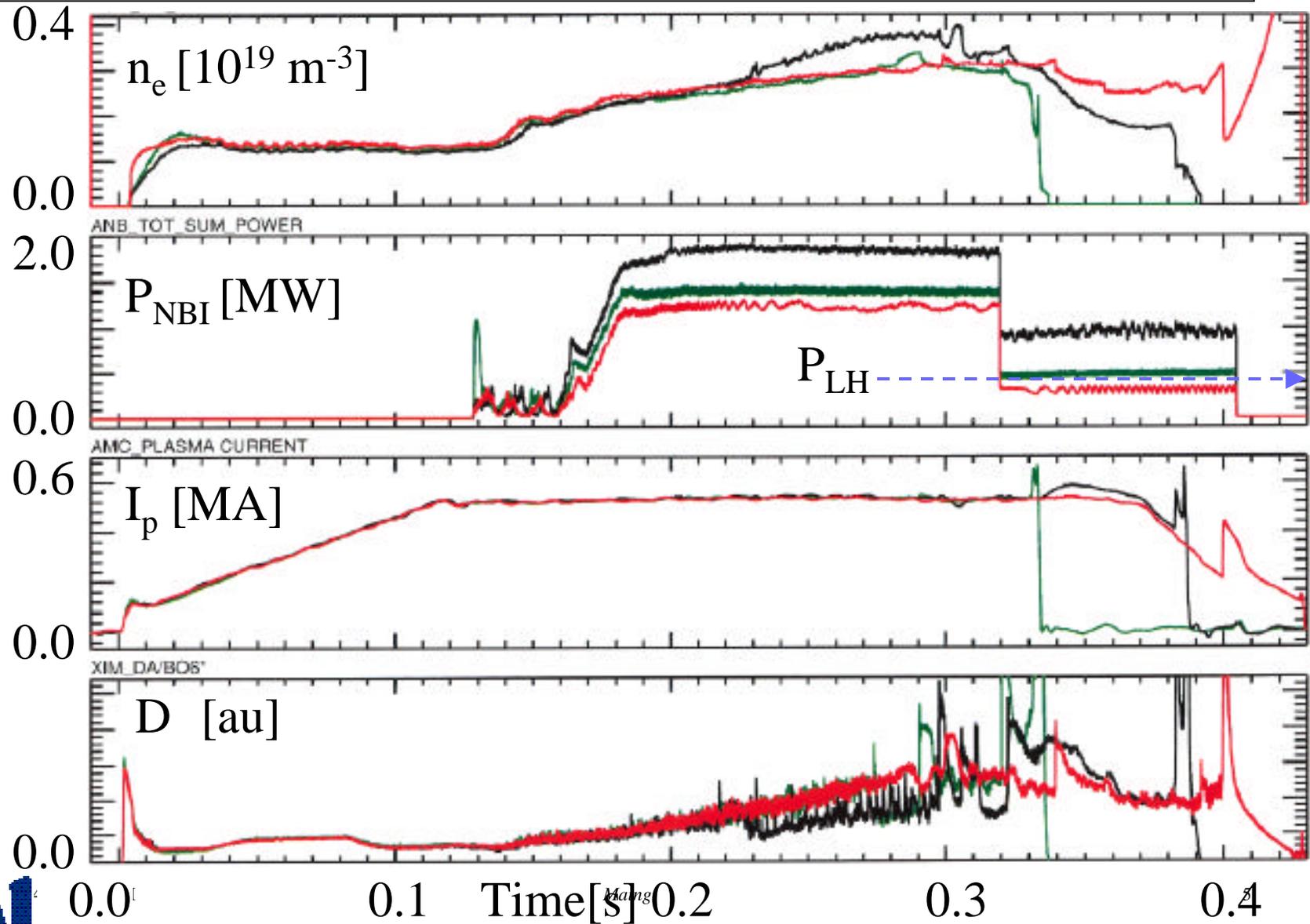
### Results

- $P_{LH} \sim 260\text{ KW}$  in DN ( $I_p \sim 0.5\text{MA}$ ,  $B_t \sim 0.45\text{T}$ ,  $n_e \sim 1.4e19\text{ m}^{-3}$ )
- $P_{LH} \sim 1400\text{ KW}$  in LSN ( $n_e \sim 3e19\text{ m}^{-3}$ , late transition)
- DN transition appeared very dithery, small change in  $E$
- LSN had obvious transition, and time of transition was delayed as  $P_{in} \sim P_{LH}$  (like NSTX)
- High  $I_p$ ,  $P_{NBI}$  ELMy H-mode in DN looked similar to NSTX  
DN on the surface

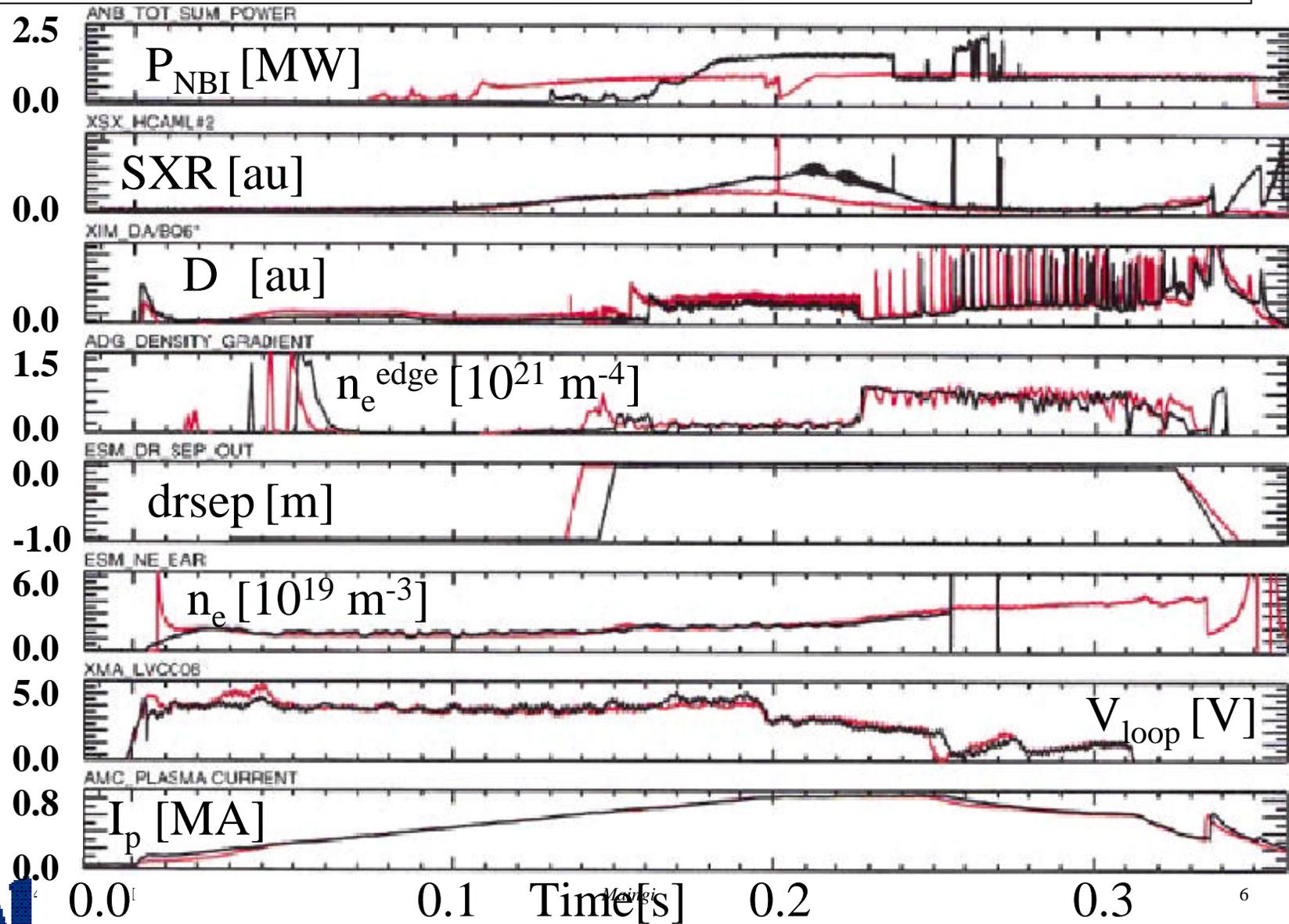
## Dithery H-mode in DN near $P_{LH}$



## Clear H-mode Transition in LSN near $P_{LH}$



# High $P_{\text{NBI}}$ ELMy H-mode developed in NSTX shape



## Details of NSTX proposal

Goals (1 day):

- Measure  $P_{LH}$  in DN with a fine scan around  $drsep=0$
- Measure  $P_{LH}$  in LSN and USN,  $drsep \geq 1-2$  cm
- Use 1-2 src. DN for ELMy H-mode comparison ( $I_p \sim 0.8$ MA)

Considerations:

- Try for time of divertor formation and  $I_p$  flattop time to be before NBI start time
- Is LSN truly a power threshold? How do we determine this?